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Dendrochronological assessment of common ash stands in areas of intensive dieback

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Abstract. The widespread dieback of the common ash (*Fraxinus excelsior* L.) is one of the most pressing issues, caused by both global climate change and the spread of dangerous infectious diseases. Analysis of how the combination of hydrothermal stress and various types of pathogens affects the viability of stands is critical for developing strategies to conserve forest ecosystems. The study aimed to conduct a comprehensive dendrochronological assessment of the condition of ash stands and to analyse the dynamics of tree radial growth under conditions of varying degrees of pathogen infestation and the influence of climatic factors. The study was based on the collection of growth cores using age-specific borers from trees in various condition categories: healthy (control), affected by sulphur-yellow tinder fungus, canker tumours, and in areas of intensive dieback. Analysis of annual ring width was conducted by scanning the samples and subsequently processing them in the specialised software ImageJ with the ObjectJ plugin. Climatic analysis was conducted using archived temperature and precipitation data for the period from 1979 to 2025. A steady trend towards climate warming (an increase in the mean annual temperature of 2.5-3.0°C) and moisture deficit was identified, creating conditions of chronic

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hydrothermal stress for ash trees. The study established that trees in areas of intense dieback show a sharp reduction in radial growth, which is no longer linked to the climatic trend due to pathological weakening. Infection by tinder fungi and canker tumours leads to a gradual decline in growth or high variability in growth rates; however, it has a less critical impact on viability over short time periods compared with halar necrosis. The obtained data can be used to apply radial growth indicators as an accurate indicator of stand condition for the early diagnosis of forest degradation. The results can be utilised by forestry enterprises to optimise sanitary measures and predict the resilience of ash forests under changing environmental conditions

Keywords: radial growth; climate change; forest pathogens; halar necrosis; annual rings; stand vitality; hydrothermal stress

Introduction

Forest dieback and degradation are complex processes driven by numerous factors, including the long-term weakening of forest stands, adverse weather conditions, and subsequent infestation by pests and pathogens. Climate change, prolonged droughts and unstable groundwater levels are central. As a result, trees become less resilient, and stress factors contribute to their decline, which is further accelerated by the activity of harmful organisms (Tkach & Kobets, 2025).

Trees of the ash genus (*Fraxinus* sp.) have significant ecological and economic potential; they are typical mesotrophs and occur as subdominants in forest ecosystems. K. Davydenko *et al.* (2022) established that climate change caused the issue of ash dieback, the main causes of which are climatic factors, halar necrosis caused by the invasive pathogen *Hymenoscyphus fraxineus* L., and the emerald ash borer *Agrilus planipennis Fairmaire* L. (Emerald ash borer (EAB)), which in the future may cause the complete disappearance of ash trees from forest ecosystems. In the publication by N. Puzrina *et al.* (2025), the authors investigated the distribution and extent of damage to ash trees caused by the emerald ash borer. They monitored trees of the genus *Fraxinus* in 2021-2023 and concluded that *Agrilus planipennis* poses a substantial threat to ash trees in the study area, and that further research is needed to develop control measures for this invasive pest. S. Klesse *et al.* (2021) established a negative correlation between growth energy and the susceptibility of *Fraxinus excelsior* to *Hymenoscyphus fraxineus*: trees with narrower annual rings and smaller sapwood vessel diameters exhibit more severe crown dieback symptoms and higher mortality. The authors demonstrated that defoliation directly reduces the growth and maximum diameter of earlywood vessels, creating a positive feedback loop that accelerates tree decline.

Tree growth in a stand is determined both by external factors (microclimatic, soil-hydrological, etc.) and by the physiological characteristics of the tree species. Tree diameter growth depends on the genotype's response to precipitation and heat levels and their distribution throughout the year (Netsvetov *et al.*, 2021). Weather conditions are substantial in the deterioration of trees' physiological condition, as they determine the level of stress experienced by stands during the growing season. Prolonged droughts, rising average annual temperatures, sharp fluctuations in weather conditions, and soil moisture deficits lead to a disruption of the plants' water balance, a reduction in photosynthetic activity, and the suppression of growth processes. As a result, tree vitality declines, creating conditions for subsequent infection by pathogens. Weather events are particularly dangerous – summer droughts, late spring and early autumn frosts, as well as abnormally warm winters. Under such conditions, trees lose their natural resistance to biotic factors, in particular to xylophagous insects and pathogens of infectious diseases. Weakened trees are more heavily infested by pests, notably ash bark beetles, and are also affected by disease-causing agents, particularly those responsible for halar necrosis (Shvidenko *et al*., 2018).

In the field of forest ecology research, tree ring growth is widely used as a comprehensive indicator that can provide a relatively rapid and objective assessment of the condition of forest stands in both spatial and temporal terms, as well as determine the extent of damage to tree stands caused by natural or anthropogenic stress factors.

I.M. Koval (2021) investigated the dendrochronological basis for assessing pine and oak stands in Ukraine, in which the author analysed the response of tree rings to climate change and anthropogenic stressors in various natural zones of the country. The study showed that the sensitivity of radial growth to climatic factors and air pollution varies depending on tree species and growing location, which is substantial for assessment of the condition of forest ecosystems and predicting their response to environmental changes. O. Lesnik *et al.* (2022) assessed the growth and physiological resilience of pine forests in the Ukrainian Polissya. Their study demonstrated that various environmental factors and anthropogenic influences shape trees' adaptive mechanisms and affect forest productivity. V. Myroniuk *et al.* (2026) proposed a method for estimating the current annual increment of stands based on single measurements of trees on temporary sample plots. The results of their study were used for the rapid determination of growth volume and the spatio-temporal characteristics of forest stands.

Despite the considerable body of research devoted to assessing tree radial growth and the resilience of forest stands to pathogens and climatic stresses, a number of unresolved issues remain. In particular, the complex interaction of chronic hydrothermal stress and various types of pathological damage on the long-term growth and viability of common ash in natural stands has not been sufficiently studied.

The study aims to identify patterns in changes to radial growth under the combined influence of chronic hydrothermal stress and pathogenic factors, to assess their impact on tree vitality, and to identify indicators of early stand degradation.

Materials and Methods

The study was conducted on an area of 4.5 hectares in a stand with a stocking level of 0.5, aged 120 years, comprising 7As2O1Hb (As – common ash, O – common oak, Hb – common hornbeam) of natural origin. The average stand height was 31 m, the average diameter 44 cm, site class I, forest type D_2HO (D_2 – fresh fertile site, HO – hornbeam-oak forest), and volume 280 $m^3 \cdot ha^{-1}$ (Fig. 1).

AshF AshC AshDB AshK

Figure 1. *Categories of tree condition from which cores were taken*

Note: AshF – trees bearing tinder fungus fruiting bodies, AshC – trees with cancerous growths, AshDB – trees in areas of severe dieback, AshK – trees showing no signs of drying out (control group)

Source: photo by the authors

The dieback of trees in this stand began in 1997, as evidenced by data from the Monitoring forest pathologies (n.d.) resource, which notes the sanitary felling operations and the reasons for the dieback. To determine the current growth of forest stands in this study, a method was used to estimate the percentage of growth based on the results of measuring the width of annual rings on increment cores This method was used to directly assess the intensity of radial growth in the trees of the stands under study, enabling the characterisation of their current growth without the use of growth tables (Myronuk *et al*., 2019; Lesnik *et al*., 2022). The advantage of this approach over the use of growth tables is the direct study of tree growth in the study area, as well as the relative simplicity of collecting field data. In Ukraine, this approach was scientifically substantiated by K.E. Nikitin in the 1960s and is the primary among the approximate methods for estimating growth, which does not require the felling of sample trees.

The spatial framework for tree selection was designed based on the characteristics of damage to common ash trees caused by various pathogens, namely infection by the sulphur-yellow polypore *Laetiporus sulphureus* (AshF), trees showing signs of canker (AshC), and trees in areas of severe dieback (AshDB). Core samples were also taken from healthy ash trees showing no signs of damage (AshK). Annual growth cores were collected from sample trees of common ash; four sample plots were established for core sampling. At each plot, measurements of the diameters and heights of 3-4 inventory trees were taken, from which increment cores were collected at a trunk height of 1.3 m using Haglöf (Sweden) age-determining augers (Fig. 2). To measure tree diameters, two mutually perpendicular measurements were taken using Haglöf aluminium measuring callipers. Tree heights were measured using a Halgöf Electronic Clinometer (HEC, Sweden).

Figure 2. *Selected growth cores from monitored common ash trees with various types of damage*

Note: AshF – trees bearing tinder fungus fruiting bodies, AshC – trees with cancerous growths, AshDB – trees in areas of severe dieback, AshK – trees showing no signs of drying out (control group)

Source: photo by the authors

The annual growth cores from the sample trees were placed in wooden holders, and the collected data were processed in the office. The data on the diameter and height of the sample trees in the test plots were used to calculate the average values of the stand's inventory parameters from which the cores were taken (average diameter, average height, and evenness).

The selected growth cores were first sanded using fine-grit sandpaper and then scanned in *.jpg format at a resolution of 3200 dpi (Fig. 3). The images obtained were processed using the ImageJ software with the ObjectJ plug-in installed, which is designed for dendrochronological research. Growth cores were analysed, and annual growth rings were marked. Based on this, data on the annual dynamics of radial growth in the sample trees were obtained. A fragment of the cores processed in the ObjectJ programme is shown in Figure 4.

AshK

Figure 3. *A scanned sample with growth rings mounted on a wooden strip*

Source: photo by the authors

AshDB

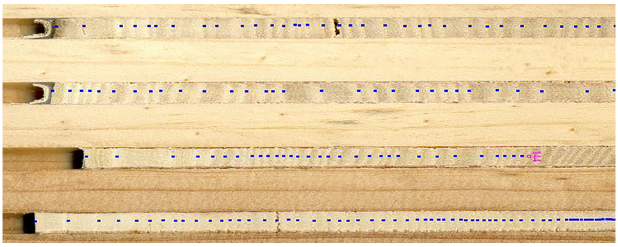

Figure 4. *A screenshot showing the processing of a sample with embedded cores in the ObjectJ programme*

Source: photo by the authors

Archival data on weather conditions in the study region for the period 1979-2025 were analysed using data from Meteoblue (n.d.). The desk-based work involved processing the collected data and analysing the results obtained. Experimental plant studies complied with national and international guidelines and adhered to the standards of the Convention on Biological Diversity (1992).

Results and Discussion

Changes in climatic conditions contribute to the expansion of the ranges of harmful organisms and an increase in the number of their generations during the growing season, which significantly exacerbates their harmful effects. Combined with anthropogenic pressure, this causes a disruption of the ecological balance of forest ecosystems, a decline in stand productivity and their gradual degradation; therefore, an analysis of changes in weather conditions over the study period was first conducted. Archival weather data for the study region from 1979 to 2025 demonstrate a marked warming of the climate (Fig. 5). The average annual air temperature has risen from approximately 7.5-8°C in the late 1970s and early 1980s to 10.5-11.5°C in 2015-2025; the overall increase is approximately +2.5-3.0°C. The trend line corresponds to an increase of approximately 0.004-0.05°C per year (or about 0.4-0.5°C per decade). Until 1995, negative temperature anomalies prevailed (up to -1+1.5°C below normal), whereas since 2000, positive deviations have dominated, reaching +1-+2°C in 2015-2025. Such quantitative changes indicate a significant warming of the region's climate, accompanied by increased evaporation and a moisture deficit (Fig. 6).

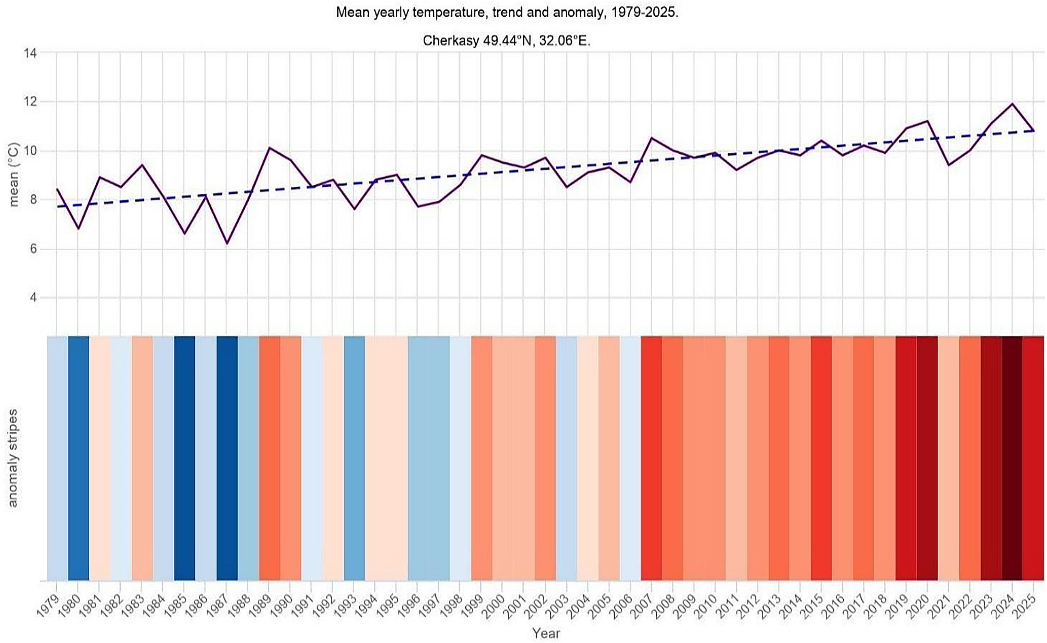

Figure 5. *Trends in the average annual temperature, 1979-2025*

Source: compiled by the authors based on Meteoblue (n.d.)

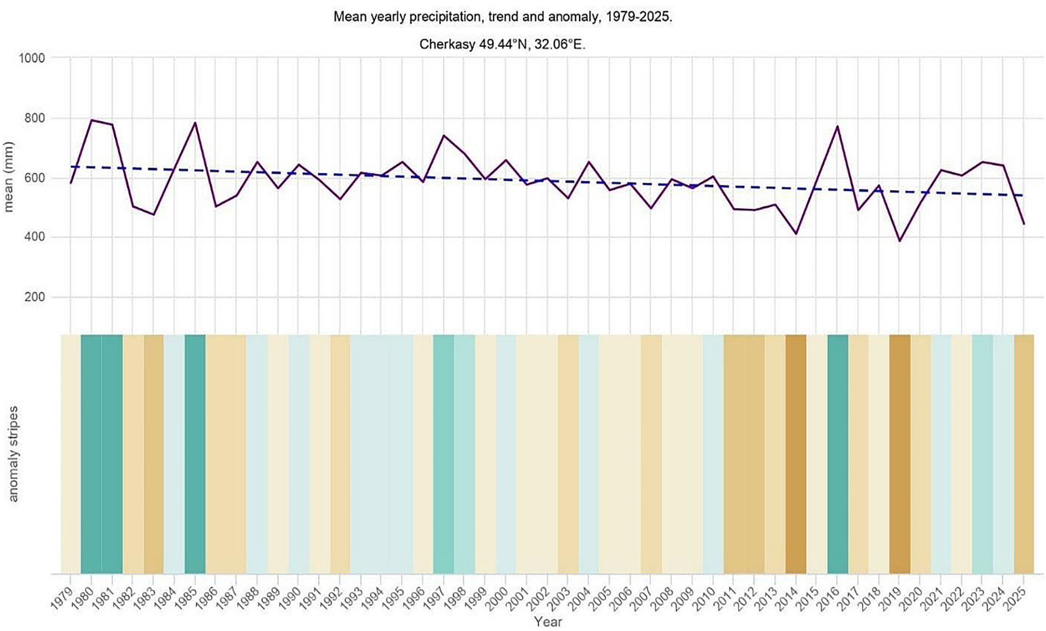

Figure 6. *Trends in average annual precipitation, 1979-2025*

Source: compiled by the authors based on Meteoblue (n.d.)

An analysis of annual precipitation in the region for the period 1979-2025 shows that, in the context of significant interannual variability, a slight but consistent trend towards decreasing moisture levels is emerging. Whilst in the 1980s the average annual precipitation was predominantly 600-700 mm, with peaks of up to 750-800 mm, between 2000 and 2025 these figures fell to 550-600 mm, and in some particularly dry years to 400-450 mm. The overall decrease over the period is around 80-100 mm, which corresponds to approximately 15-20 mm per decade. Combined with an increase in the average annual temperature of +2.5-3°C, this leads to a sharp rise in evaporation and the development of a moisture deficit. Analysis of monthly temperature and precipitation anomalies indicates a change in weather patterns (Fig. 7).

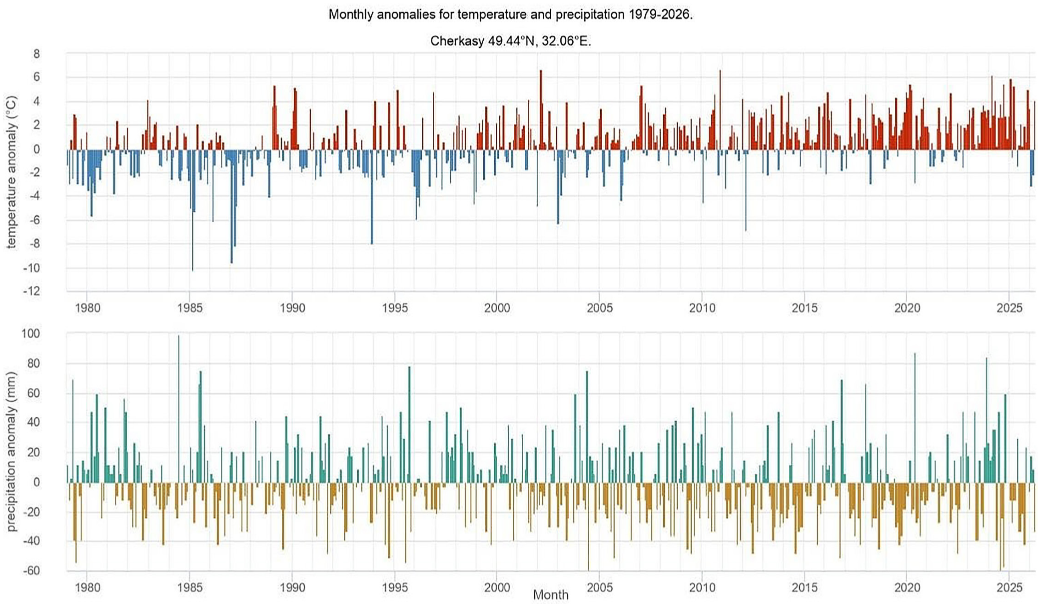

Figure 7. *Trends in temperature and precipitation anomalies*
Source: compiled by the authors based on Meteoblue (n.d.)

The data show that temperatures have risen significantly: until the mid-1990s, colder-than-average temperatures predominated, whereas since 2000 warmer-than-average temperatures have been the norm, with peaks of +4 to +6°C and above, and severe cold spells have become rare. Precipitation remains variable, but since the 2000s, moisture deficits (30-60 mm) have been observed more frequently. A correlation is observed: rising temperatures are often accompanied by a lack of precipitation, creating arid conditions and exacerbating the hydrothermal imbalance. As a result, chronic hydrothermal stress develops, which negatively affects ring width, leading to narrower annual rings, and increases the trees' susceptibility to pathogens, a key factor in dieback.

An accurate assessment of forest stand growth is a key foundation for sustainable forest management. It can be used to analyse the productivity of forest stands, identify patterns in their growth, determine how trees develop under the influence of various factors (biotic and abiotic), and optimise the use of forest resources. Stand growth can be estimated using models of forest stand growth and productivity (growth tables);

however, such estimates require field verification and comparison with actual data.

Following the processing and analysis of data from increment cores, graphs of radial growth in millimetres were produced for each year in plots with various types of damage and in the control plot. The radial growth of common ash in plots showing no signs of damage demonstrates the typical growth pattern of ash under these forest conditions (Fig. 8).

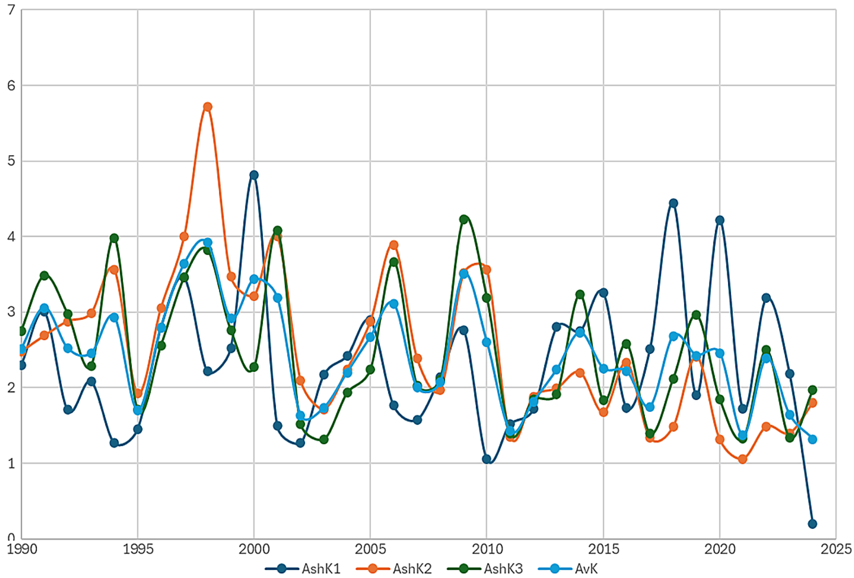

Figure 8. *Radial growth of common ash without signs of damage (control)*
Note: AshK1-AshK3 – measurement results for model trees; AvK – average
Source: compiled by the authors

The graph shows that the model trees exhibit interannual variability in growth, with the highest values occurring in the late 1990s and early 2000s. The average growth rate (AvK) varied mainly within the range of 1.5-3.5 mm and showed relatively stable trends. Since 2010, there has been a slight decline in average growth rates and an increase in variation between individual trees.

The fluctuations in growth on the graph reflect the influence of climatic factors (temperature, precipitation). The synchronisation of the growth curves of different trees (AshK1-AshK3) indicates that the main limiting factor is the climate, rather than pathological factors. The sulphur-yellow polypore *Laetiporus sulphureus* causes heart rot. As the fungus destroys the central part of the trunk (the heart), the conductive function of the sapwood (the outer layers of wood) is often preserved for a long time (Fig. 9). Figure 9 shows a relatively stable growth rate over a long period of the disease. A sharp decline in growth on such graphs usually occurs only in the later stages, when the tree loses its mechanical stability, or the rot affects the sapwood, disrupting the water supply to the crown. At the same time, some model trees are characterised by significant interannual fluctuations in radial growth, which may be linked to the trees' individual response to the development of the pathological process and the influence of climatic conditions. The highest growth rates were observed in 2020-2024, particularly in tree AshF2, where growth exceeded 7-8 mm. The average growth rate (AvF) remained relatively stable throughout the study period, with a tendency towards gradual increase, indicating that growth processes were maintained even in the presence of infection by the sulphur-yellow bracket fungus.

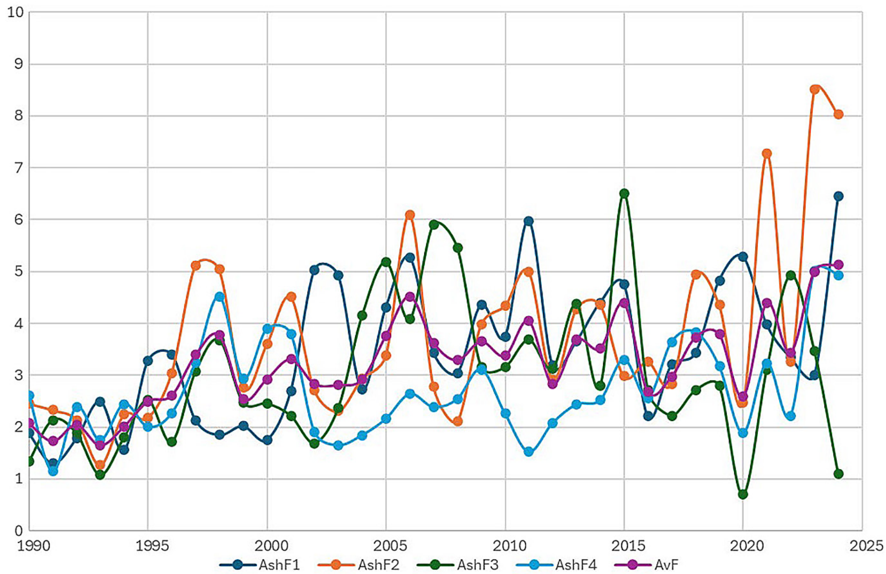

Figure 9. *Radial growth of common ash affected by sulphur-yellow tinder fungus*
Note: AshF1-AshF4 – measurement results for model trees; AvF – average
Source: compiled by the authors

The pathogens that cause tumours to form on the trunk directly affect the bark and cambium; consequently, the growth rates shown on the graph may exhibit high variability. If the cancerous tumour does not completely encircle the trunk, the tree may compensate for the loss by increased growth on the other side of the trunk (eccentric growth) (Fig. 10).

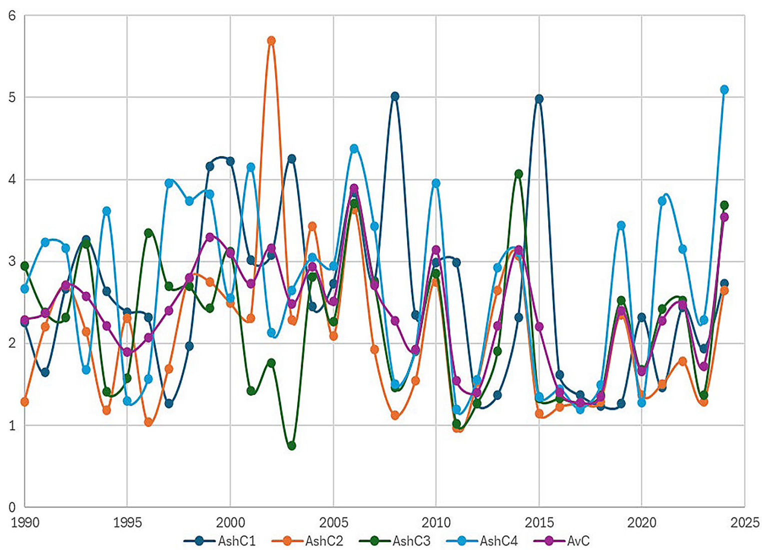

Figure 10. *Radial growth of common ash with the presence of cancerous tumours*
Note: AshC1-AshC4 – measurement results for model trees; AvC – average
Source: compiled by the authors

A gradual, undulating decline in growth is typically observed, as the tree's vascular system is affected more slowly than in cases of vascular mycoses, but more rapidly than in cases of heart rot. The graph shows significant year-to-year variability in the radial growth of the model trees, with periodic increases and decreases in the figures. Average growth (AvC) during the study period varied mainly within the range of 1.5-3.5 mm, indicating that growth processes were partially maintained even in the presence of cancerous tumours. Since 2010, there has been a trend towards a decrease in average growth values and an increase in variation between individual trees.

The radial growth of common ash in areas affected by severe dieback, particularly ash dieback (caused by *Hymenoscyphus fraxineus*), has shown a sharp and irreversible decline in annual ring width over the last 10-20 years (Fig. 11).

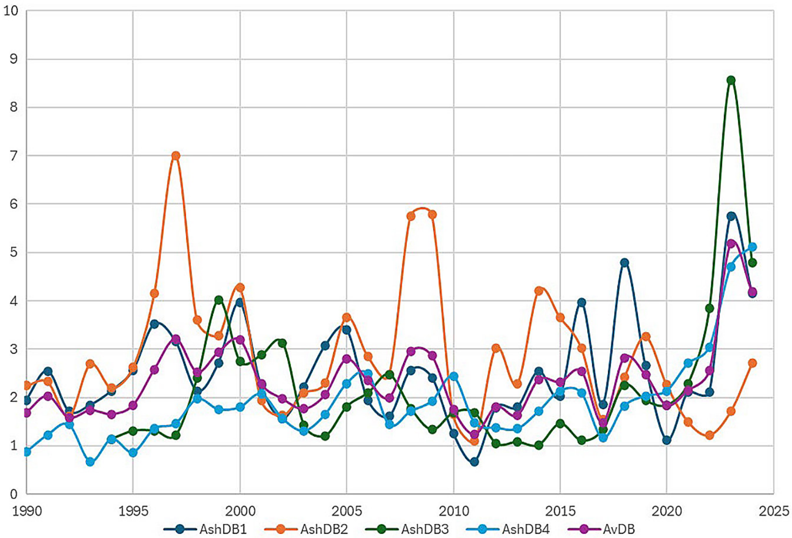

Figure 11. *Radial growth of common ash in areas of severe dieback*

Note: AshDB1-AshDB4 – measurement results for model trees; AvDB – average

Source: compiled by the authors

At a certain point (the onset of infection), the growth curves "break away" from the climatic trend (as seen in the control) and drop sharply, regardless of whether the year was favourable in terms of precipitation. This is a clear indicator of pathological weakening leading to the death of the tree. The average values of radial growth for common ash, depending on the type of damage, are shown in Figure 12. The data in Figure 12 show that, in both control trees and those with canker tumours, negative growth trends have been observed since the stands were first affected, whereas trees with tinder fungus fruiting bodies and in areas of intense dieback show an increase in radial growth, confirming the conclusion that the conductive function of the sapwood is often preserved for a long time after infection. The most pronounced decline in growth is characteristic of trees with canker tumours, where a sharp suppression of growth processes has been observed since 2015. At the same time, trees with polypore fruiting bodies demonstrate the highest growth rates, particularly in 2023-2024. Trees in areas of intensive infection are characterised by significant interannual fluctuations in growth, which may be linked to the trees' stress response and reduced competition in damaged stands.

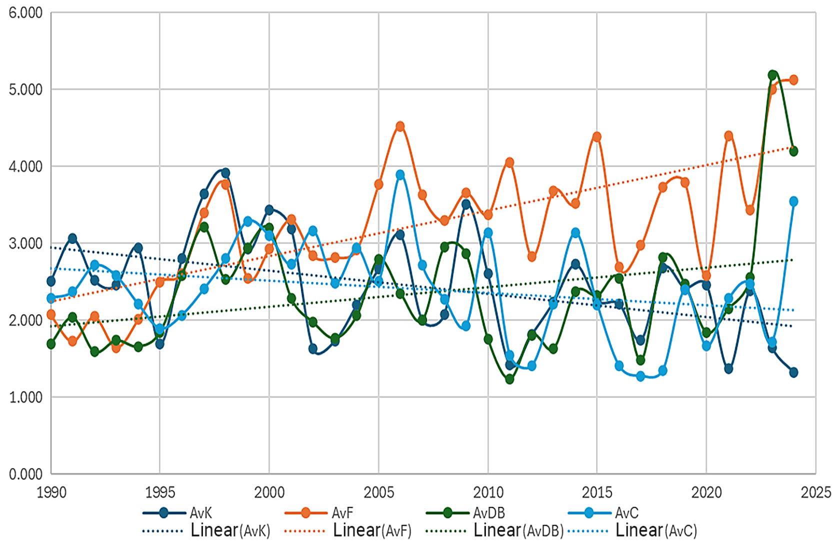

Figure 12. *Average values of radial growth across different types of lesions*

Note: AvF – trees bearing tinder fungus fruiting bodies, AvC – trees with cancerous growths, AvDB – trees in areas of severe dieback, AshK – trees showing no signs of dieback (control group) with linear change tendency

Source: compiled by the authors

According to the presented data, over the period 1979-2025, the average annual air temperature rose by 2.5-3.0°C, whilst the precipitation deficit increased by 80-100 mm. This is consistent with the findings of A.Z. Shvidenko *et al.* (2018), who indicated that climate change in Ukraine is becoming irreversible, creating conditions for the physiological weakening of broad-leaved tree species. Our results confirm that rising temperatures are often accompanied by a lack of precipitation (deficits of up to 30-60 mm), which causes chronic stress and is consistent with the findings of M. Netsvetov *et al.* (2021) regarding the potential for identifying the climatic sensitivity of species in their natural environment.

The results of the study indicate that the impact of short-term stress responses on the physiological resilience of tree stands is negligible; they achieve maximum resilience to adverse environmental factors at the age of 50-60 years and older. A comparison of the results of the study on the physiological resilience of stands with the data of O. Lesnik *et al.* (2022) revealed minor differences within the peak periods. A. Pliûra *et al.* (2011) established that, despite the widespread infestation of European populations by the pathogen *Hymenoscyphus fraxineus*, there are significant inter- and intra-population differences in the degree of crown defoliation and the intensity of necrosis formation. A substantial finding of the study is the identification of an inverse correlation between tree growth rate and their susceptibility to the pathogen: individuals with higher growth energy often demonstrate better survival capacity, although the overall condition of the stands remains highly dependent on environmental conditions. In the present study, control trees with an increment of over 2.0 mm showed synchronisation with the climate and an absence of visual signs of crown degradation. This confirms that maintaining high growth energy in stands is a prerequisite for their resilience. Consequently, these results indicate the need to select genetically resistant biotypes as a fundamental basis for the restoration of ash forests in regions with a high incidence of infection.

A.N. Drogvalenko *et al.* (2019) note that the highest incidence of infection was observed in stands up to 80 years old, with an ash proportion of 40-70% and a canopy cover of over 0.5. The disease was most prevalent in fertile, moist growing conditions, which are also the most favourable for ash growth. According to M. Keßler *et al.* (2012), a correlation between disease severity and location has been confirmed. These results indicate a high prevalence of ash dieback and a complex interplay of factors influencing the development of the disease, highlighting the need for further research to develop effective measures for the conservation of ash stands in Ukraine. The results of the present study are consistent with the research by Z. Vacek *et al.* (2017), which investigated changes in the productivity of ash stands in the Krkonoše Mountains (Czech Republic) under the influence of H. fraxineus and climatic factors during 2009-2015. The authors recorded a 15.2% increase in tree mortality and an intensification of dieback symptoms, particularly in stunted individuals in waterlogged areas. C.C. Roibu *et al.* (2020) developed the first differentiated dendrochronological series (earlywood, latewood, total ring width) for ash from Eastern Europe (Moldova) and found a significant negative correlation between growth and temperature and a positive correlation with precipitation and SPEI, confirming the increased sensitivity of ash to hydrothermal stress in the region.

A study by K. Davydenko *et al.* (2013) documented the presence of *Hymenoscyphus pseudoalbidus* in the leaves and shoots of common ash in eastern Ukraine, indicating a potential threat to tree stands in this region. Compared with the current study, which showed a sharp and irreversible decline in tree ring growth in areas of intense dieback, particularly due to halar necrosis, the findings of K. Davydenko *et al.* confirm that the presence of the pathogen directly correlates with reduced tree productivity. At the same time, the current data complement previous findings, demonstrating not only the fact of infestation but also its impact on the long-term growth dynamics of trees and the disruption of correlations with climatic factors, which underscores the importance of a comprehensive assessment of the condition of stands for predicting forest degradation. The study by H. Mazurchuk *et al.* (2025) on ash dieback in the Kyiv Polissya show that the rapid, critical dieback of ash trees is the result of a complex interaction between *Agrilus planipennis*, stem pests, as well as fungal and bacterial pathogens, which has a significant impact primarily on large-diameter trees. Dendrochronological series from the current study indicate that the critical decline in growth began approximately 10-20 years ago, which chronologically coincides with the phases of active spread of the Asian longhorned beetle in Ukraine. I.P. Matsiakh & V.O. Kramarets (2014) investigated the dieback of common ash in western Ukraine and found the disease to be widespread across various types of stands, depending on age, density and site conditions. Compared with the current study, which recorded a sharp decline in radial growth in areas of intense dieback, their results confirm the influence of local conditions on the intensity of the pathological process; however, the current data add a spatio-temporal perspective and demonstrate the interaction between climatic and pathogenic factors.

The health status of ash stands in the Forest-Steppe region requires careful investigation to establish the cause-and-effect relationships that caused its deterioration. Studies of individual chronologies of meteorological conditions and ring growth can be used to determine the physiological resilience of ash trees in stands, i.e. assess the extent to which physiological stress affects the growth and development of the stand. T. Kowalski (2006) found that throughout the entire growth period, stands of various tree species are subject to physiological stress, as evidenced by data from other studies. V.V. Melnyk & O.V. Zborovska (2018) investigated the radial growth of Scots pine in the Zhytomyr Polissya on plots where no thinning had been conducted following the Chornobyl nuclear power plant accident. They demonstrated that the absence of management measures affects growth rates and the overall condition of the stands.

The dieback of ash trees in Ukraine is caused by the combined effects of the invasive fungus *Hymenoscyphus fraxineus*, the emerald ash borer, and associated pathogens. Damage is mainly observed in stands of a certain age and composition, whilst climatic stresses further exacerbate the degradation. This situation indicates a significant deterioration in the health of ash forests and necessitates measures for their conservation and restoration.

Conclusions

A study of the condition of common ash (*Fraxinus excelsior* L.) stands in the context of climate change and pathological influences has led to the following conclusions. An analysis of meteorological data for the period 1979-2025 confirmed a consistent trend towards climate aridification. An increase in the average annual air temperature of 2.5-3.0°C has been recorded (from 7.5-8°C at the start of the period to 10.5-11.5°C in the last decade). A moisture deficit is observed; the average annual precipitation has decreased by 80-100 mm, which, combined with the temperature regime, creates conditions of chronic hydrothermal stress.

A dendrochronological assessment revealed specific responses of trees to different types of damage. Healthy trees maintain relative stability (average growth of 1.5-3.5 mm), but since 2010, interannual fluctuations in growth have been observed due to climatic factors. In trees with canker tumours, a sharp decline in growth intensity has been observed since 2015. In areas of intense dieback, a reduction in the width of annual rings has been recorded over the last 10-20 years. A characteristic feature is the 'divergence' of growth curves from the climatic trend, indicating the dominance of pathological factors over abiotic ones. Infection by the sulphur-yellow polypore (*Laetiporus sulphureus*) in the early and middle stages does not significantly restrict radial growth (up to 7-8 mm in individual trees in 2020-2024), as the sapwood's conductive function is maintained for a long time.

The study established that in severely weakened trees, the correlation between radial growth and climatic factors is disrupted. This indicates that pathological processes become the dominant influencing factor, negating the tree's positive response to favourable weather conditions. The dendrochronological method using software (ImageJ, ObjectJ) is sufficiently accurate for retrospective assessment of the condition of forest stands and can identify the onset of tree degradation before visual signs of crown dieback appear. Further research addresses the genetic resistance of individual ash trees that maintain stable growth within infection foci.

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Conflict of Interest

None.

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Дендрохронологічна оцінка стану насаджень ясена звичайного в осередках інтенсивного всихання

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Анотація. Масове всихання ясена звичайного (Fraxinus excelsior L.) є однією з найгостріших проблем, зумовленою як глобальною зміною клімату, так і поширенням небезпечних інфекційних захворювань. Розуміння того, як поєднання гідротермічного стресу та різних типів патогенів впливає на життєздатність насаджень, є критично важливим для розробки стратегій збереження лісових екосистем. Мета роботи полягала у проведенні комплексної дендрохронологічної оцінки стану ясеневих насаджень та аналізі динаміки радіального приросту дерев за умов різного ступеня ураження патогенами та впливу кліматичних чинників. Дослідження базувалося на відборі прирісних кернів за допомогою вікових бурів у дерев різних категорій стану: здорових (контроль), уражених сірчано-жовтим трутовиком, раковими пухлинами та в осередках інтенсивного всихання. Аналіз ширини річних кілець виконувався шляхом сканування зразків та їх подальшої обробки у спеціалізованому програмному забезпеченні ImageJ з плагіном ObjectJ. Кліматичний аналіз проводився за архівними даними температури та опадів за період з 1979 по 2025 роки. Виявлено стійку тенденцію до потепління клімату (зростання середньорічної температури на 2,5-3,0°С) та дефіциту вологи, що створює умови хронічного гідротермічного стресу для ясена. Встановлено, що дерева в осередках інтенсивного всихання демонструють різке зменшення радіального приросту, яке втрачає зв'язок із кліматичним трендом через патологічне ослаблення. Ураження трутовиками та раковими пухлинами призводить до поступового зниження приросту або його високої варіабельності, проте менш критично впливає на життєздатність на коротких часових інтервалах порівняно з халаровим некрозом. Отримані дані дозволяють використовувати показники радіального приросту як точний індикатор стану насаджень для ранньої діагностики деградації лісів. Результати можуть бути застосовані лісогосподарськими підприємствами для оптимізації санітарних заходів та прогнозування стійкості ясеневих лісів у мінливих екологічних умовах

Ключові слова: радіальний приріст; кліматичні зміни; патогени лісу; халаровий некроз; річні кільця; життєздатність насаджень; гідротермічний стрес